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Proceedings of the Regional Peer Review of the Assessment of American Lobster (*Homarus americanus*) in Newfoundland

May 10-11 and May 16, 2016
St. John's, NL

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A Regional Peer Review Process for the Assessment of American Lobster (*Homarus americanus*) in Newfoundland was held May 10-11 and May 16, 2016 in St. John's, Newfoundland and Labrador (NL). The purpose of the meeting was to assess the status of the American Lobster resource in four regions: the Northeast Region (Lobster Fishing Areas (LFAs) 3-6), the Avalon Region (LFAs 7-10), the South Coast Region (LFAs 11-12), and the West Coast Region (LFAs 13-14) and provide data to be used in the updated Integrated Fisheries Management Plan (IFMP).

Participation included Fisheries and Oceans Canada (DFO) Science, Ecosystems Management, and Fisheries Management Branches, fishing industry, academia, and the Office of the Auditor General of Canada.

Detailed rapporteur's notes of the discussion that followed each presentation were produced. This Proceedings Report includes abstracts and summaries of meeting presentations, as well as a list of research recommendations. The meeting's Terms of Reference, agenda, and list of participants are appended.

Compte rendu de l'examen régional par les pairs de l'évaluation du homard d'Amérique (Homarus americanus) à Terre-Neuve

SOMMAIRE

Un processus régional d'examen par les pairs pour l'évaluation du homard d'Amérique (*Homarus americanus*) à Terre-Neuve a eu lieu les 10 et 11 mai 2016 et 16 mai 2016 à St. John's (T.-N.-L.). L'objectif de la réunion était d'évaluer l'état des ressources de homard d'Amérique dans quatre régions : Nord-Est (zones de pêche du homard [ZPH] 3-6), Avalon (ZPH 7-10), côte Sud (ZPH 11-12) et côte Ouest (ZPH 13-14). La réunion visait également à recueillir des données pouvant être utilisées pour mettre à jour le Plan de gestion intégrée des pêches (PGIP).

Parmi les participants, on comptait des représentants des secteurs des sciences, la direction de la gestion des écosystèmes et de la gestion des pêches de Pêches et Océans Canada (MPO) ainsi que des représentants de l'industrie de la pêche, des universités et du Bureau du vérificateur général du Canada.

Les notes détaillées du rapporteur des discussions qui ont suivi chaque présentation ont été produites. Ce compte rendu comprend un résumé et un sommaire des présentations de la réunion, de même qu'une liste de recommandations relatives à la recherche. Le cadre de référence, l'ordre du jour et la liste des participants de la réunion sont joints.

INTRODUCTION

A Regional Peer Review Process for the Assessment of American Lobster (*Homarus americanus*) in Newfoundland was held May 10-11 and May 16, 2016 in St. John's, Newfoundland and Labrador (NL). The purpose of the meeting was to assess the status of the American Lobster resource in four regions: the Northeast Region (Lobster Fishing Areas (LFAs) 3-6), the Avalon Region (LFAs 7-10), the South Coast Region (LFAs 11-12), and the West Coast Region (LFAs 13-14) and provide data to be used in the updated Integrated Fisheries Management Plan (IFMP).

Participation included Fisheries and Oceans Canada (DFO) Science, Ecosystems Management, and Fisheries Management Branches, fishing industry, academia, and the Office of the Auditor General of Canada.

This Proceedings Report includes abstracts of presentations and summaries of meeting discussions. Additional information can be found in the Science Advisory Report (SAR) or from references cited therein.

PRESENTATIONS

THE NEWFOUNDLAND GREEN CRAB INVASION AND THE POTENTIAL IMPACT ON THE LOBSTER FISHERY

C. McKenzie, K. Matheson, and T. Wells

Presenter: C. McKenzie

Abstract

European green crab were first reported in August 2007 in Newfoundland by a fish harvester in North Harbour, Placentia Bay. The green crab were believed to be present in Placentia Bay since 2002 based on the population size ranges and previous surveys (Blakeslee 2010). Genetic studies have shown these populations are more closely similar to populations from eastern Nova Scotia and are cold tolerant. This cold tolerance has allowed the Newfoundland population to survive harsh winter and thrive in shallow coastal areas, particularly in eelgrass habitats. Initially (2007) the highest densities (>200) were found to be primarily at the northern end of Placentia Bay (Northern Harbour and Come by Chance), with very few (<15) found in other areas. The 2007 survey indicated that the southern range of green crab was Davis Cove on the western side and Placentia on the eastern side of Placentia Bay. The range of green crab has since expanded throughout several areas of Newfoundland. By 2015, green crab were found throughout Placentia Bay (Lamaline, Merasheen Island, Placentia) the west coast (Bay St. George, Bay of Islands) as far north as Port Saunders. It is the recent invasion (2014) of Fortune Bay that is of particular concern. Fortune Bay is identified as an area of high importance because of relatively large local lobster populations. Impacts of green crab have been observed throughout Placentia Bay and include displaced native rock crab, impacts to shellfish (visible shell remains), predation on lobster (juvenile lobster found within green crab gut content studies) and loss of eelgrass (Matheson et al. 2016). Further research on green crab has examined movement of green crab (acoustic tagging), population density estimates, and studies examining predation on shellfish species (Matheson and McKenzie 2014). Crab behaviour appears to be linked to temperature as decreases in temperature act as a cue for crabs to move into deeper waters (results from acoustic tagging experiment). Nearly 20,000 kg of green crab were captured in 2014 and 2015 during a trial mitigation in Placentia Bay in collaboration with

the Fish, Food and Allied Workers Union (FFAW) and the Department of Fisheries and Aquaculture (DFA). The numbers of green crab can be reduced by trapping but requires extensive continuous efforts and is affected by bait choice, and the geography of the fishing area. Overall, research and surveys on green crab in Newfoundland has been a large collaborative effort including many stakeholders and partners. Since detection in 2007, green crab may have negatively impacted the lobster resource through direct predation, competition, and indirect habitat modification. The expansion of green crab into Fortune Bay, a high lobster-producing area, has heightened this concern.

Discussion

There was a question as to whether there were controls used in the study of the effects of green crab on eelgrass. It was confirmed that there were controls used and that the study was extensively discussed in a peer-reviewed process. The investigators are very confident that green crab are causing impacts to eelgrass beds.

A question was raised regarding potential positive effects of the green crab invasion. Based on observations, it was stated that lobsters have co-existed with green crab since 1817 in New England and since the 1950s-60s in southern Nova Scotia. It was explained that the Newfoundland population (originating from a cold tolerant second invasion in Nova Scotia) are considerably more aggressive than the earlier cold limited southern Nova Scotia and New England green crab, and are having an impact on Newfoundland lobsters. In the past, green crab and lobsters coexisted in southern Nova Scotia, New Brunswick and New England; however, the aggressive northern species is now moving south and impacting eelgrass beds and lobsters. The growth of the northern, aggressive species of green crab in the Maritimes Region has resulted in a large impact to eelgrass beds and lobster over the past two years.

One participant asked where the green crab had originated. It was explained that there are two populations of green crab in the Northwest Atlantic which originated from Europe. The population that inhabits New England waters is a warm water species from southern Europe and arrived in New England via ballast water. This population moved north until it reached its temperature limit in southern Nova Scotia and New Brunswick. During the 1980s, there was an introduction of a cold tolerant population from northern Europe or Iceland. These two populations are hybridizing and the resultant hybridized population is much more aggressive. The hybridized population has been found in areas such as Placentia Bay and Fortune Bay.

It was noted that green crab are not invasive in their native environments. In their native habitats, shorebirds are able to control the green crab populations through predation; however, shorebirds in Newfoundland have rarely been observed to prey on green crab. Potential predators, such as large rock crab, large lobsters, seabirds, and otters have shown little impact in controlling green crab in Newfoundland.

There was a question regarding the usage of green crab as lobster bait. Anecdotal evidence from lobster harvesters in Placentia Bay and Bay St. George suggest that lobsters in Newfoundland are not attracted to green crab when used as bait. In the Maritimes Region, green crab has been used as lobster bait, possibly because the green crab population is less aggressive, and both lobsters and green crab have coexisted for many years; this is not true for Newfoundland green crab and lobsters. It is unknown whether this is due to green crab population characteristics or a result of an early invasion effect.

Further explanation was requested regarding green crab parasites in lobsters. It was explained that data pertaining to green crab parasites in lobsters are the results of a preliminary, unpublished report from the Atlantic Veterinary College in Prince Edward Island. This report suggests that green crab parasites were found in lobsters held in lobster pounds. The parasites

made the lobsters ill and it is thought that these parasites originated from green crab used as lobster bait. While the report has received media attention, it was stressed that the report was based on preliminary work. Due to the potential for parasite transfer through green crab as lobster bait, one participant asked whether there could be a moratorium placed on the usage of green crab as bait in Newfoundland. It was explained that the use of green crab as bait is currently banned in Newfoundland and has never been permitted. There are presently only experimental licences for green crab and the licence specifically states that the green crab caught cannot be used live or as bait. In Newfoundland, one cannot buy, hold or sell green crab; however, in Nova Scotia, Prince Edward Island, and the Gulf Region these acts are permitted.

One participant asked whether the effects of green crab on lobster landings had been investigated at a finer scale in Placentia Bay. It was explained that when working in Placentia Bay, the investigators were mostly concentrating on eelgrass. During a recent attempt to explore this issue, investigators were having difficulty finding lobsters in Placentia Bay on which to conduct the study. The Aquatic Invasive Species (AIS) program at DFO is currently working on interactions between green crab and lobster. In 2016, the AIS program will be conducting research in Fortune Bay, which will include surveys and cameras on traps as part of a collaborative study with Memorial University of Newfoundland and the Marine Institute.

One participant asked whether a directed green crab fishery could reduce the high abundance of green crab in some areas. It was explained that the DFO AIS program, in collaboration with the FFAW and the DFA, has investigated whether green crab populations can be controlled at low-levels or eliminated via harvesting. The goal of a potential green crab harvest would be to keep green crab below 35 mm carapace width (i.e. the size at which green crab have been found to reproduce in Placentia Bay) and then let predators assert population control. The largest issue concerning a directed green crab fishery is what to do with the catch. The AIS program explored possible uses for green crab, but has not found an economical use for green crab in Newfoundland. Green crabs that were caught in a previous depletion experiment were used as compost on the West Coast of Newfoundland; however, it was articulated that the transport of green crab catch from a commercial fishery is unlikely to be financially viable. The use of green crab as a food source was investigated, but deemed too expensive to process. It was stressed by a participant that there is concern regarding the start of a green crab fishery as they do not wish to see a long-term, sustainable demand for green crab in NL.

It was stated that the current focus of the AIS program is to gain further understanding of green crab impact in Fortune Bay. This includes determining areas with and without the presence of green crab and their relative abundance. In addition, the AIS program aims to investigate habitat preference of green crab in Fortune Bay, the overlap of green crab with other species (i.e. lobster and rock crab), and potential movement patterns.

EFFECTS OF THE EASTPORT MARINE PROTECTED AREA ON LOBSTER FECUNDITY AND GROWTH

V. Howse, P. Snelgrove, D. Schneider, and C. Konrad

Presenter: V. Howse

Abstract

Marine Protected Areas (MPAs) are frequently established to allow protected portions of populations to develop, so that larger individuals and offspring may ultimately enhance surrounding fishing areas through dispersal. To examine whether MPAs achieve these goals, before-after-control-impact (BACI) design studies are typically implemented. Our study investigated spillover of larger more fecund American lobster from the Eastport MPAs, which

were established in Bonavista Bay, NL in 1997. Since neither data prior to establishment nor clear controls were available, this study employed a gradient design.

The distance from the MPA boundary did not affect the fecundity or carapace length of local lobster. A mark recapture program has been ongoing since the MPA was established in 1997. Data were collected inside and in close proximity to the two islands that make up the MPA. We fitted a generalized von Bertalanffy growth-model using the carapace length of tagged individuals that have been recaptured at least once. This model was used to realistically fit the non-asymptotic growth pattern of the American lobster. Outside the MPA we detected a higher rate of growth annually, with female growth slightly faster than males. The MPA has an effect on the growth rates of local lobster demonstrated by the larger, slower-growing individuals found inside its boundaries.

Discussion

One participant questioned the use of *a* and *b* instead of the traditionally used *k* and $L\infty$ in the growth rate estimations. It was explained that this accounts for the stepwise growth of lobsters as opposed to the growth seen in fish. To clarify, the paper which uses this equation (Bevacqua et al. 2010) was made available for participants to review during the break.

There was a question regarding the random approach used to calculate distance from the MPA. It was explained that the presenter did not have bathymetry data and therefore water layer was used, and the random path lobsters could take was calculated.

One participant noted that the simple removal of individuals does not change the size they will achieve and questioned statistics used in the research.

It was noted that there was a v-notching effort in 1997 in Eastport and a question was raised regarding whether this could have affected data from this study. It was noted that there was no available information regarding the timing of v-notching and that it could be looked at as a confounding factor.

One participant asked whether growth in different size classes could be investigated using the data from this study. The presenter believed there are enough data to complete this analysis and that she would investigate in the near future.

In reference to results pertaining to lobster fecundity measured over a gradient of increased distance from the MPA boundary which indicated no spillover of ovigerous females from the MPA boundary, one participant suggested that it is possible that the ovigerous females are not moving and getting caught, and therefore data are omitting very highly fecund lobsters.

It was clarified that the presenter was not making assumptions or conclusions regarding the results of the study at this time, but rather only presenting the findings.

AN ASSESSMENT OF AMERICAN LOBSTER (*Homarus americanus*) IN NEWFOUNDLAND IN 2015

E. Coughlan, G. Evans, W. Coffey, D. Stansbury, and J. Pantin

Presenter: E. Coughlan

Abstract

American Lobster (*Homarus americanus*), in Newfoundland, are harvested near shore by approximately 2,450 license holders in LFAs 3-14C. The fishery is managed by input controls including a minimum legal size of 82.5 mm carapace length (CL), prohibition on landing

v-notched or ovigerous females, limited entry, seasons and trap limits. The number of active fishers, duration of season, and trap limits vary by year and LFA.

The Newfoundland lobster assessment was completed for four regions which are a geographical grouping of LFAs into Northeast (LFAs 3-6), Avalon (LFAs 7-10), South Coast (LFAs 11-12) and West Coast (LFAs 13-14). Data available for the assessment was solely fishery-dependent. The key indicators for the assessment are reported landings, nominal effort, mean catch per unit effort (CPUE) and survival fraction.

Total reported landings for Newfoundland have remained relatively stable since the 1960s, and were 2,750 t in 2015. Since 2010, landings have decreased in the Avalon, have increased in the South and West Coast regions, and have not changed in the Northeast. Nominal effort (based on active fishers, trap limits and fishing days) decreased by 45% since 2006 due to license retirements, fewer active fishers, shorter seasons, and trap limit reductions. CPUE has increased gradually over the past decade. Most size frequency distributions clearly show a sharp drop at legal size and few lobsters achieving the second molt class, indicating that most of the exploitable biomass is caught in the year of recruitment to the fishery. Survival of unprotected lobster (male, non-ovigerous non-v-notched female), relative to protected lobster (ovigerous female), is low. In addition, within the legal size, large lobsters survive better than small lobsters.

Northeast Region Discussion

It was noted that there was a drop in logbook returns for 2013 and therefore discrepancy between the mean CPUE values from the DFO logbooks and the FFAW logbooks.

With regards to the figures presented on weekly CPUE, it was noted by a participant that most fishing occurs during the first 2-4 weeks of the fishery and that the same scale was used for the entire region even though the starting date is staggered by LFA.

It was noted by a participant that the decrease in nominal effort in the Northeast Region was not due to license retirements; however, some enterprise combining did occur in the region.

There was a question regarding the figures presented on cumulative catch. It was confirmed that data was only from DFO logbooks. There was a suggestion to use total catch on the x-axis instead of cumulative catch.

Clarification was requested regarding the difference between DFO and FFAW logbooks. It was explained that DFO logbooks are mandatory and focus on collecting data pertaining to the number of lobsters and trap hauls. The FFAW logbooks started in 2002 and are an index fishery logbook that is more detailed and specific than DFO logbooks. The FFAW logbooks provide a time series of representative harvesters and obtain quality data from the same harvesters annually.

In reference to a statement regarding low mandatory logbook returns, one participant asked about repercussions for harvesters who do not return their logbook. It was explained that Conservation and Protection (C&P) may investigate incidents of missing logbooks. It was noted by a participant that in Nova Scotia, if a harvester does not return their logbook they will not receive a license for the following year.

There was discussion surrounding the issue of local sales (unreported landings). It was stated that there are no data on local sales and that the lack of data causes issues pertaining to the incorporation of landings in the assessment. One participant asked whether research was being completed to address this knowledge gap. It was explained that no research is currently ongoing to address this issue. It was also noted that in 2015 the Provincial Government made

regulatory changes under *the Fish Inspection Act* and *Food Premises Act* (Fisheries and Aquaculture 2015) that encourage local sales. However, it was also mentioned by a participant that local sales may not have been high over the last few years as harvesters were relying more heavily on lobsters due to declines in other species, and therefore were not selling locally. It was stated that the data gap pertaining to local sales could be addressed if more logbooks were returned by harvesters.

Two suggestions were made by participants to explain the increase in landings and effort in the Northeast Region:

1. Due to a decrease in crab stocks, harvesters were fishing more lobster; and
2. The price for lobster was high last year, which encouraged more harvesters to fish for lobsters.

It was also noted that although the DFO and FFAW logbooks reported slightly different mean CPUEs in 2014 and 2015, they showed the same trends.

Avalon Region Discussion

Clarification was requested regarding whether v-notching percentages from FFAW logbooks referred to lobsters which harvesters' v-notched daily, or daily caught lobsters which already had v-notches. It was explained that both questions are asked in the logbooks; however, the figure presented referred to the lobsters that were v-notched by the harvester each day. One participant noted that harvesters also occasionally re-notch old v-notches.

There was discussion surrounding figures presented which depicted weekly CPUE from DFO and FFAW logbooks. In both cases, CPUE was very low at the beginning of the 2015 season. One participant asked whether correlations had been performed to determine the reason for the low level, to which the answer was no. There was a suggestion that cold temperature could have affected CPUE in that there may have been a delayed fishery.

One participant noted that there were thermographs used in the Avalon Region and suggested that a temperature-corrected CPUE be used. This suggestion was developed into a research recommendation.

South Coast Region Discussion

It was noted that there were enforcement issues regarding questionable v-notching in this region and that could be the reason for low levels of v-notching in the South Coast Region.

There was discussion regarding the cumulative catch for 2010 from DFO logbooks. There was concern that high landings were recorded for the region, but figures showed a low cumulative catch. It was determined that this was not due to low logbooks returns and required further investigation. Upon further investigation, missing values were discovered and once the analysis was re-run this issue was corrected.

It was noted that the relatively high CPUE in 2015 for this region could be due to an increased number of license retirements in the five years previous.

The discrepancy between the DFO logbooks and the FFAW logbooks for 2014 was questioned. The data was re-checked and the results did not change. The reason for the discrepancy is unknown.

There was discussion regarding the size frequency distributions presented for the South Coast Region. It was observed that few lobsters survive to reach the N_2 size category. One participant suggested that demographic diffusion could be occurring whereby large lobsters leave or avoid

areas of high lobster density and intense competition for areas of low density and relaxed competition.

There were observations of a 90-120 mm CL healthy size class of lobsters moving through this region in 2015. The lobsters were observed to be mostly female, and in some areas the lobsters were found at depths of 80-100 fathoms. It was noted that lobsters can inhabit these depths; however, lobsters are not commonly found at these depths. One participant questioned whether it is possible to relate lobsters in deep water to the decline in Snow Crab.

One participant mentioned that catch rates so far in 2016 are very variable in the South Coast Region; some harvesters are reporting high catch rates, while others are reporting low catch rates.

West Coast Region Discussion

There was no discussion on the presentation for the West Coast Region.

Relative Survival, Commercial Catch Structure and Landings Predictions Discussion

There was discussion regarding the survival analysis methodology. It was observed that if the survival plots were not on a log scale, then the slope would appear similar to the slope of the depletion plots. One participant asked whether the x-axis of the survival plots could be cumulative removals instead of time. A participant explained that the data came from at-sea sampling which did not include cumulative removals information; however, it was confirmed that the suggested change to the x-axis was a valid option. It was also noted that to turn relative survival into a measure of absolute survival depends on the natural mortality of the denominator (N_1 ovigerous lobsters).

There was discussion regarding the interpretation of the relative survival plots for males and females. It was noted that the take home message of the analysis was that there is strong evidence that large lobsters survive better than small lobsters. One participant asked whether moving gear throughout the season could affect the survival analysis. It was explained that the analysis could be performed by using home port or harvester instead of LFA; however, this does not provide any information regarding harvester behaviour. It was also noted that there is still an issue regarding low catches of large lobsters in areas of high abundance, such as the South Coast Region.

There was discussion regarding the relative survival plots for v-notched lobsters. It was noted that the confidence intervals were large due to small sample sizes. This raised concern with a participant as to whether the analysis is reliable since it is based on a small sample size. One participant commented that it would be interesting to see the results of this analysis divided by LFA; however it was explained that this was not possible due to the small sample sizes.

With reference to a relative survival plot of N_1 as a fraction of N_2 that was presented, there was an observation that N_1 lobsters are subject to unexpected high levels of mortality. It was noted that there is ongoing research at the University of New Brunswick on early molting that could contribute further understanding of N_1 lobster mortality.

The low levels of relative survival seen in the survival plots were questioned by a participant. It was stated by a participant that they could not think of a sampling artefact that could have influenced the results.

The question of whether there is a relative change in catchability over the season was raised. It was noted that there is published literature regarding the catchability of lobster traps in relation

to lobster densities and sizes inside the trap, as well as the catchability of lobster traps when other species are present.

There was a question as to how relative survival results would be affected if the denominator changed throughout the season (i.e. if ovigerious females extruded eggs during the fishing season). It was explained that this would increase the relative survival. One participant noted that for the last three years, Stage 3 lobsters have not been seen until the last couple weeks of the fishery. This indicates that the females are retaining their clutch throughout the season and therefore there should not be any change to the denominator (N_1 ovigerous lobsters).

It was noted that a survival analysis on the Eastport data was considered; however, the data did not provide the distance the lobsters were caught in relation to the MPA, and therefore the analysis could not be completed.

With reference to the plot presented for CPUE of large male and large female lobsters, one participant noted that it is logical to use 120 mm CL as a measure for a large female lobster as that length is the size at which their reproductive strategy shifts, but questioned the use of 120 mm CL for male lobsters. It was explained that 120 mm was also used for males to maintain consistency.

There was discussion regarding the modified traps used to collect pre-recruit lobster data. One participant thought smaller gauge wire traps would be better to collect pre-recruit lobsters. Another participant noted that the majority of lobsters caught in the modified traps are between 60 mm and 70 mm CL. There was also a question regarding the pre-recruit CPUE versus. future landings analysis presented and whether patterns were being overlooked due to the data being from a large area. A suggestion was made to look at this data at a finer scale (e.g. harvester level). This suggestion was developed into a research recommendation.

There was an observation made that the size of the entrance ring on traps has decreased over time; however, the length frequencies have remained the same.

GENERAL DISCUSSION

Dissatisfaction was expressed regarding how some data could not be presented at the LFA level due to compliance with revised Government of Canada guidelines on the release of information. DFO can no longer report landings and catch information if a data set has fewer than five fishers, vessels, or buyers. These guidelines ensure that private information cannot be extracted from the data. It was explained that, where possible, presented data was combined to ensure compliance with the privacy guidelines. Participants voiced concern that problematic trends may not be apparent when data from individual LFAs are aggregated. This concern was particularly stressed with regards to LFA 10, in which there have been considerable declines in catch rates and landings.

The decline in landings in LFA 10 was discussed among participants and three causes of the decline were proposed:

1. Environmental changes;
2. Introduction of green crab; and
3. Marine traffic.

It was also noted that the decline in landings in LFA 10 is confusing for participants, as there are two areas within that LFA that still have good catch rates. Conversely, these two areas did not have good catch rates when the rest of the LFA did have good catch rates.

A suggestion was made that future lobster assessments should not occur during the lobster fishing season, as it is difficult to obtain harvester participation. All participants were in agreement with this suggestion.

SCIENCE ADVISORY REPORT BULLETS

There was discussion surrounding the statement that there has been an increase in landings in the Northeast Region. It was noted that there was only an increase in 2015. It was decided that a reference time period was required and 2010 was chosen from which to report changes.

A participant proposed a bullet which included a statement that landings reflect abundance. Many participants felt this was not accurate as other factors such as gear change, unreported landings and temperature may affect reported landings. One participant also mentioned that there were issues regarding catchability. For these reasons, the statement that "landings reflect abundance" was removed.

There was discussion surrounding whether a bullet pertaining to length frequencies should be added. There was a suggestion that there should be a reference to exploitation within the bullets, but another participant articulated that the bullets pertaining to survival referenced exploitation. It was noted that size frequencies do not show a particular point in time, but rather that size frequencies show the distribution over a season. There was consensus among the participants to include a bullet pertaining to length frequencies.

A participant proposed a bullet which stated that the efficacy of v-notching as a protective measure is unclear. Some participants stressed that there are positive effects of v-notching in the literature. One participant noted that the purpose of v-notching is survival. At the time of discussion, the survival of v-notched versus non-v-notched lobsters had not been investigated; however this analysis was completed overnight and discussed with meeting participants the following day. The proposed bullet was removed and the bullets pertaining to survival were used to communicate the analysis of v-notching.

There was discussion surrounding whether a bullet pertaining to green crab should be included. It was noted that during the 2013 lobster assessment, there was not enough available data to necessitate a green crab bullet. Since 2013, additional research has been completed and participants agreed that the threat of green crab was significant enough to require a bullet.

NORTHEAST REGION BULLETS DISCUSSION

One participant pointed out that there was a difference between the CPUE figures presented and those calculated from numbers taken from the figure on landings and nominal effort. It was explained that this was because the CPUE figure used data from logbooks (which uses what is caught each day), whereas landings do not take into account local sales (i.e. unreported catch).

There was a question regarding whether the use of wire or wooden traps would have an effect on CPUE. An industry participant noted that wire traps have greater catchability compared to wooden traps and that not all harvesters use the same type of trap. It was explained that this information is not recorded in logbooks; therefore this could not be taken into account. There was a recommendation to add 'type of trap' to logbooks. One participant suggested DFO calculate a conversion factor for catchability between wire and wooden traps similar to the conversion factor calculated for the change in gear in DFO multi-species trawl surveys.

There was a statement by a participant regarding whether the information presented constituted an assessment. This question arose based on previous discussions regarding the limitations of the usage of CPUE and landings data, as well as how fishery independent data was not used in

the assessment. There was a feeling among some participants that there was insufficient data to fully assess the status of the resource. It was noted that there is no official DFO definition of "assessment", whereas other organizations provide definitions. The National Oceanic and Atmospheric Administration (NOAA) were given as an example; NOAA defines a complete stock assessment as having data pertaining to catch, abundance and biology. It was stated that data sources have not changed since the last assessment in 2013 and that Fisheries Management are aware of data limitations.

There was discussion as to whether a bullet on v-notching was required. A participant stated that Fisheries Management should be informed of the level of occurrence of v-notching, especially as there is renewed interest in v-notching. The consensus among participants was that there was no requirement for a v-notching bullet and as such the data was moved from the bullets to the main body of the SAR. Clarification was also requested regarding whether the values on the v-notching plots represent the rate of v-notching per year or the number of lobsters that are v-notched in the population. It was determined that the values represent the rate of v-notching per year.

There was consensus among participants that there should be a bullet for each region regarding the relative survival/mortality data presented. There was discussion on whether the bullet should reference the change in relative survival between time periods or compare the current levels of N_1 and N_2. One participant suggested that the focus of the bullet should be on the N_1 category as the majority of the population falls within this size category. A bullet was developed that addressed the relative survival of male lobsters and unprotected (non-ovigerous) female lobsters over the fishing season, but not between time periods.

Most of the discussions that occurred over the Northeast Region bullets were applicable to the other regions. Any changes that were made to the Northeast Region's bullets (e.g. removal of v-notching bullet, addition of relative survival bullet) were also made to the bullets for the other regions.

AVALON REGION BULLETS DISCUSSION

There was no discussion for the Avalon Region bullets.

SOUTH COAST REGION DISCUSSION

There was an observation that the number of v-notched lobsters increases throughout the season and that this could affect the relative survival analysis. There was concern about seasonal averages.

WEST COAST REGION DISCUSSION

There was no discussion for the West Coast Region bullets.

SCIENCE ADVISORY REPORT REVIEW

It was noted that the landings records were updated the first evening of the Regional Peer Review Process, therefore the landings numbers changed very slightly from those presented on the first day of the meeting.

It was noted that during the Regional Peer Review Process, participants developed relative survival bullets based on numbers estimated from relative survival plots. Upon calculating relative survival values from data that formed survival plots, the numbers in the bullets were updated.

There was discussion regarding the metric of size at 50% maturity (L_{50}). It was noted that there is a problem regarding assessing maturity by the presence of eggs for animals that have a biennial reproductive cycle. One participant questioned whether the number of lobsters with eggs should be doubled to calculate the number of lobsters possible of carrying eggs (i.e. mature). The sentence located within the species biology section of the SAR referring to size at 50% maturity was removed due to uncertainty.

There was discussion regarding the level of detail required in the SAR with respect to the relative survival analysis. It was decided that since this was the first time this analysis was used in the lobster assessment, it required a detailed explanation. It was also decided that a figure would be included to illustrate the methodology.

One participant noted that there were vast changes in the relative amounts of size categories over the fishing season; therefore size composition data aggregated over the fishing season is difficult to interpret. There was discussion regarding whether this issue should be developed into a research recommendation; however this did not occur. It was decided that if the data continues to be analyzed in this manner, then the above caveat would need to be highlighted.

RESEARCH RECOMMENDATIONS

The following research recommendations were discussed and developed:

1. Estimates of the magnitude of local sales (i.e. unreported landings) are needed and how they differ across time and among regions.
2. Determine the potential impact of green crab on lobster and evaluate the potential for mitigation.
3. Investigate the standardizing or weighting of CPUE indices (e.g. temperature, gear changes).
4. Investigate a pre-recruit index relative to future landings at a finer spatial scale.
5. Investigate the survival of v-notched vs. non-v-notched lobsters.
6. Investigate the means by which the assessment of this resource can be improved using additional environmental and survey data.
7. DFO logbook returns have been very low in recent years. It is recommended that a process be implemented to ensure consistent and accurate logbook returns. Increasing DFO logbook returns will contribute to a more thorough assessment of this resource. In order to account for changes in fishing gear and address concerns of catchability, DFO logbooks should collect detailed data pertaining to gear specifications (e.g. trap types, entrance rings).

A research recommendation for a fishery independent lobster survey was proposed and generated lengthy discussion. There was resistance among participants to this suggestion as many felt it lacked direction in what it was trying to address. One participant stated that there are multiple ways to solve the data issues and that a fishery independent survey is not the only way to address the issues. It was also mentioned that a very large geographical area would need to be surveyed and, unless a scuba survey were conducted, the survey would have to be a trap survey. This survey would not improve upon the data already collected from at-sea sampling of traps. A consensus was reached to not include this suggestion as a research recommendation, but instead add survey data to the final research recommendation.

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APPENDIX I: TERMS OF REFERENCE

Assessment of American Lobster in Newfoundland

Regional Peer Review – Newfoundland and Labrador Region

May 10-11 2016[1]
St. John's, NL

Chairperson: Roanne Collins

Context

The status of American Lobster in Lobster Fishing Areas (LFAs) 3-14C was last assessed in 2013. The present assessment of these stocks is requested by Fisheries Management to provide current information on the status of the resource and provide data that will be used in the updated Integrated Fisheries Management Plan.

Objectives

Assessment of American Lobster in four regions: Northeast (LFA 3-6), Avalon (LFA 7-10), South Coast (LFA 11-12), and West Coast (LFA 13-14).

Expected Publications

- Science Advisory Report
- Research Document
- Proceedings

Participants

- Fisheries and Oceans Canada (DFO; Science and Fisheries Management)
- Government of Newfoundland and Labrador, Department of Fisheries and Aquaculture
- Aboriginal communities/organizations
- Academia
- Fishing Industry
- Other Invited experts

[1] May 16-17, 2016 will be used to finalize the Science Advisory Report. All attendees are invited to participate. Summary bullets for each stock will be agreed upon in plenary during the May 10-11, 2016 meeting.

APPENDIX II: AGENDA

Regional Peer Review – Assessment of American Lobster

Newfoundland and Labrador Region

Chair: Roanne Collins

May 10-11[1] & May 16-17[2], 2016

[1] Memorial Room - Northwest Atlantic Fisheries Centre
80 East White Hills Road, St. John's

[2] EPS Boardroom - Northwest Atlantic Fisheries Centre
80 East White Hills Road, St. John's

Tuesday, May 10

Time	Topic	Presenter
09:00-09:15	Opening Remarks and Overview of Regional Peer Review Process	*Chair*
-	The Newfoundland green crab invasion and the potential impact on the lobster fishery	*Cynthia McKenzie*
-	Effects of the Eastport Marine Protected Area on lobster fecundity and growth	*Victoria Howse*
-	Lobster Assessment: Northeast (LFA 3-6), Avalon (LFA 7-10), South Coast (LFA 11-12), and West Coast (LFA 13-14).	*Elizabeth Coughlan*

Wednesday, May 11

Time	Topic	Presenter
09:00-09:15	Opening Remarks	*Chair*
-	Summary Bullets and other SAR Items	*All*

Notes:

- Health breaks will occur at 10:30 a.m. and 3 p.m. Coffee and tea can be purchased from the cafeteria.
- Lunch (not provided) will normally occur 12:00-1:00 p.m.
- Agenda remains fluid – breaks to be determined as meeting progresses.
- This agenda may change.

APPENDIX III: LIST OF PARTICIPANTS

Name	Affiliation
Erika Parrill	DFO – CSA, NL Region
James Meade	DFO – CSA, NL Region
Laura Park	DFO – Ecosystems Management, NL Region
Annette Rumbolt	DFO – Fisheries Management, NL Region
Kevin Hurley	DFO – Fisheries Management, NL Region
Cynthia McKenzie	DFO – Science, NL Region
Darrell Mullowney	DFO – Science, NL Region
Don Power	DFO – Science, NL Region
Don Stansbury	DFO – Science, NL Region
Elizabeth Coughlan	DFO – Science, NL Region
Geoff Evans	DFO – Science, NL Region
Katherine Skanes	DFO – Science, NL Region
Roanne Collins	DFO – Science, NL Region (Meeting Chair)
Julia Pantin	DFO – Science, NL Region (Rapporteur)
Dwan Street	FFAW
Erin Carruthers	FFAW
Jackie Baker	FFAW
Mildred Skinner	FFAW – At-sea Sampler
Scott Smith	FFAW – At-sea Sampler
Joan Doucette	FFAW – Harvester
Brett Favaro	Marine Institute
Nicci Zargapour	Marine Institute
Victoria Howse	Marine Institute
Brian Johnson	Marine Institute - Canadian Centre for Fisheries Innovation
Erin Windatt	Office of the Auditor General of Canada